

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



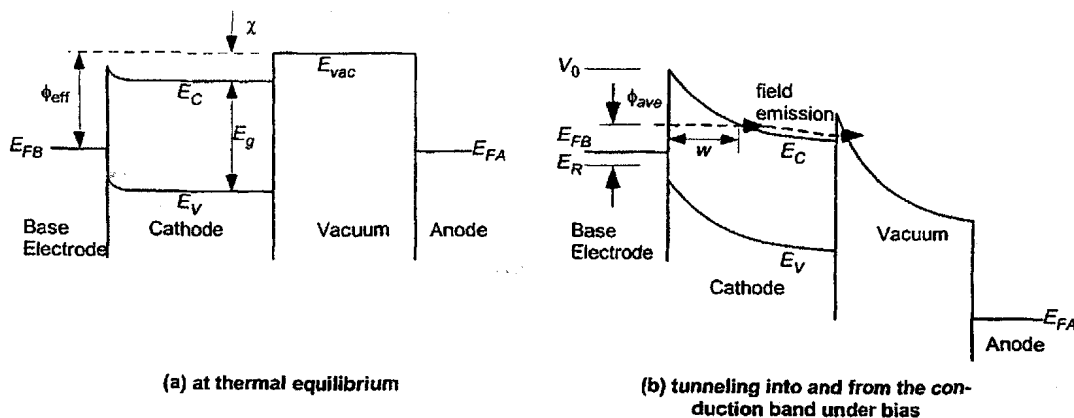
(43) International Publication Date
31 May 2001 (31.05.2001)

PCT

(10) International Publication Number
WO 01/39235 A2

- (51) International Patent Classification⁷: H01J
Nashville, TN 37215 (US). DAVIDSON, Jimmy, Lee [US/US]; 219 River Oaks Road, Brentwood, TN 37027 (US). KANG, Weng, Poo [MY/US]; 1222 Spring Creek Drive, Nashville, TN 37209 (US).
- (21) International Application Number: PCT/US00/40921
- (22) International Filing Date:
18 September 2000 (18.09.2000) (74) Agent: SHOUSE, Emily, A.; Waddey & Patterson, Suite 2020, 414 Union Street, Nations Bank Plaza, Nashville, TN 37219 (US).
- (25) Filing Language: English
- (26) Publication Language: English (81) Designated States (national): CN, JP, US.
- (30) Priority Data:
60/154,500 17 September 1999 (17.09.1999) US (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- (71) Applicant (for all designated States except US): VAN-
DERBILT UNIVERSITY [US/US]; Office of Technology
Transfer, 405 Kirkland Hall, Nashville, TN 37240 (US).
Published:
— Without international search report and to be republished
upon receipt of that report.
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): FISHER, Timothy,
S. [US/US]; 2508 Essex Place, Nashville, TN 37212 (US).
STRAUSS, Alvin, M. [US/US]; 2302 Valley Brook Road,
For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: THERMODYNAMIC ENERGY CONVERSION DEVICES AND METHODS USING A DIAMOND-BASED ELECTRON EMITTER



Band diagrams for field emission from diamond cathodes. (a) Unbiased state. (b) Under bias with tunneling into and from diamond's conduction band.

(57) Abstract: An energy conversion device adapted to enhance field emission including a diamond emitter adapted to utilize band bending to emit a high-energy distribution of electrons to produce an energy conversion effect. The invention teaches the use of band bending to enable or enhance energy conversion. Three different band bending methods are described. The first involves the use of geometric tip enhancement. The second involves the inclusion of graphite-like (sp²-bonded) molecular structures within the polycrystalline film. These two features produce band bending via small geometric features, such as tips and filaments, as governed by electrostatic theory. The third involves the incorporation of p- and n-type dopants that produce band bending via space charge